



# ALBERTA'S ENERGY STORY



**ENERGIQ**





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# INTRODUCING ENERGY IQ

**ALBERTA IS AN ENERGY-RICH PROVINCE. IT'S CANADA'S LARGEST OIL AND NATURAL GAS PRODUCER AND RANKS SECOND IN INSTALLED WIND CAPACITY IN THE COUNTRY.**

In total, the province produces six main types of energy, which travel through an intricate web of pipelines and transmission lines running across the country and into the United States.

This fact book aims to give a snapshot of Alberta's energy story, from where resources are found and how they're turned into energy to the environmental impacts of each energy source and how they contribute to Alberta's economy. This book aims to be an interesting starting point to initiate discussion and further research into the province's energy industry.

The book was produced as part of Energy IQ, an educational program created as a partnership of *Canadian Geographic* and the Canadian Association of Petroleum Producers. The program focuses on the demand, production and transmission of various energy sources in Canada today with the goal of helping to improve energy literacy across the country among Canadian students and educators.



For more information and resources, visit  
[energyiq.canadiangeographic.ca](http://energyiq.canadiangeographic.ca)

# OVERVIEW OF ALBERTA

ALBERTA PRODUCES SIX MAIN TYPES OF ENERGY: CRUDE OIL (MOSTLY IN THE FORM OF THE OIL SANDS), NATURAL GAS, COAL, HYDROELECTRICITY, WIND POWER AND BIOMASS.



## FAST FACTS

**4.2** CURRENT POPULATION (MILLION)

**11.7** % OF CANADIAN POPULATION

**19** % OF CANADA'S GDP

**62.8** % OF CANADA'S ENERGY PRODUCTION

**20** % OF CANADA'S ENERGY DEMAND

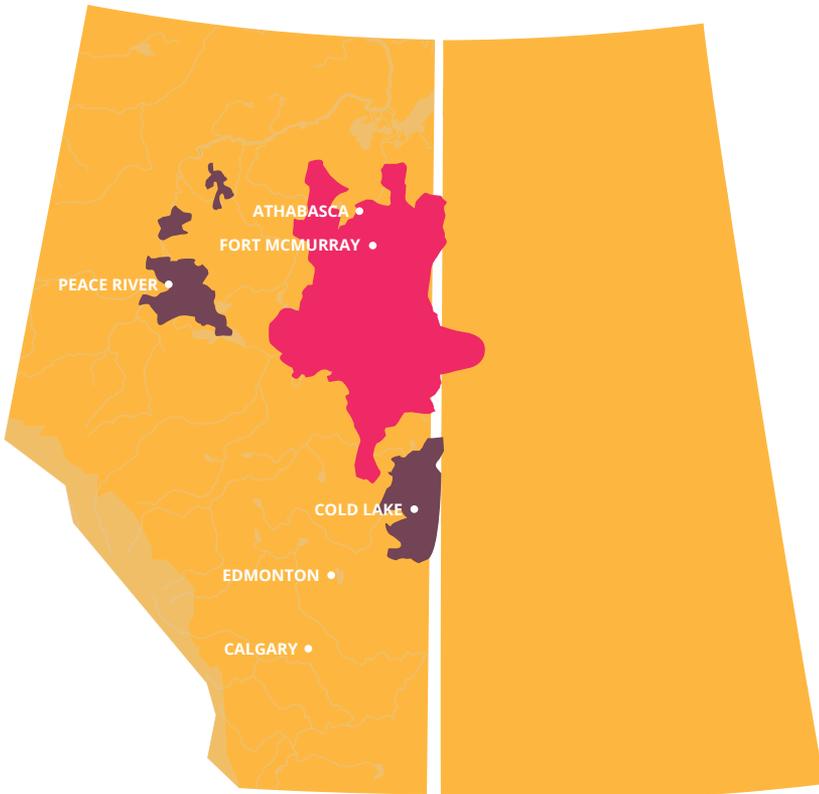


Learn more about how energy is produced in Alberta and across the country at [energyiq.canadiangeographic.ca/energy\\_mix](https://energyiq.canadiangeographic.ca/energy_mix)

# OIL SANDS

**FOR YEARS, ALBERTA'S CRUDE OIL CAME FROM CONVENTIONAL WELLS DRILLED THROUGHOUT THE PROVINCE. BUT OVER THE PAST 25 YEARS, THE SHARE OF ALBERTA'S OIL FROM THE OIL SANDS HAS INCREASED DRAMATICALLY.**

About 80 per cent of Alberta's crude oil production now comes from the oil sands. The province has three oil sands regions. The largest, and by far the most well known, is the Athabasca oil sands near Fort McMurray. About 300 kilometres west of Fort McMurray are the Peace River oil sands, while directly southeast of the city is the Cold Lake oil sands, which straddle the Saskatchewan border. All three regions are geographically unique. The oil that comes from each area is also distinct.

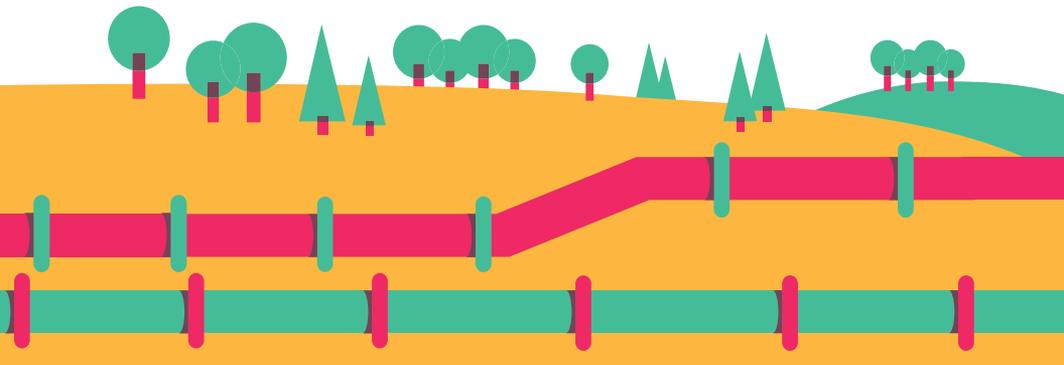


**THE ATHABASCA OIL SANDS** form the only oil deposit shallow enough to be excavated using trucks and open-pit mines. Still, some of the Athabasca oil sands are buried deeper and are therefore extracted using steam-assisted gravity drainage to avoid disturbing the soil, trees and wildlife on the surface. Meanwhile, the Peace River oil sands, the smallest of the

three regions, are found deep below the ground throughout the Peace River watershed and are also removed using steam-assisted gravity drainage. The Cold Lake oil sands are unique because, while they are also buried deep in the ground, some of the oil is fluid enough to be pumped to the surface using traditional oil wells.

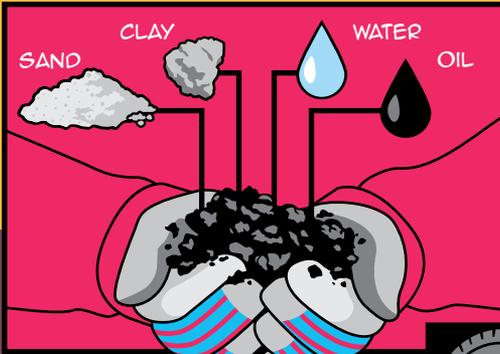


**THE PEACE RIVER AND ATHABASCA OIL SANDS** are in the rugged and remote northern half of Alberta while the Cold Lake oil sands are located northeast of Edmonton. Roads and railways in these regions are sparse, making it necessary to build long pipelines to move the oil to refineries in Canada and the United States.

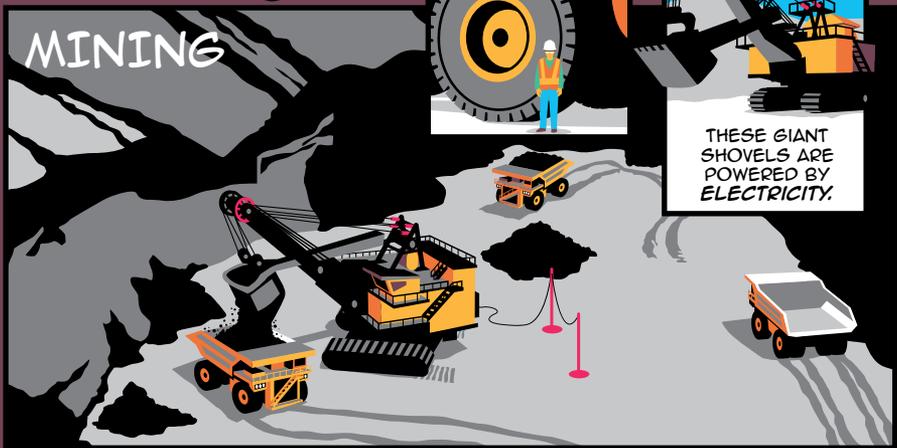


# ALBERTA'S ENERGY

# OIL SANDS



THIS MIXTURE IS TOO THICK AND HEAVY TO FLOW AND IS USUALLY EXTRACTED FROM THE GROUND USING EITHER STRIP-MINING OR STEAM-ASSISTED GRAVITY DRAINAGE.



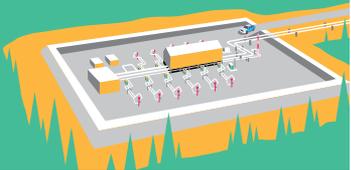
## MINING

STRIP-MINING IS USED WHEN THE OIL IS CLOSE ENOUGH TO THE SURFACE THAT IT CAN BE DUG UP USING EXCAVATORS, WHICH LOAD IT ONTO LARGE TRUCKS AND TAKE IT TO A PROCESSING PLANT.



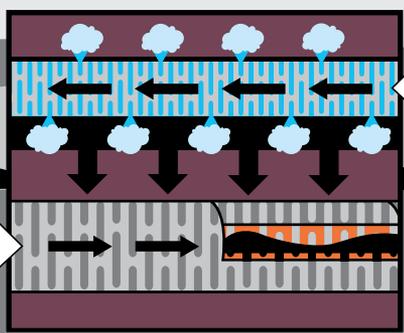
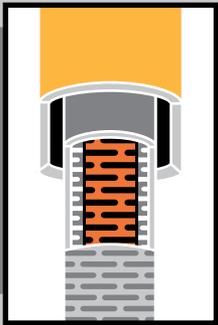
THERE THE OIL SAND IS MIXED WITH HOT WATER TO REMOVE THE SAND AND CLAY.

IF THE OIL SANDS ARE TOO DEEP IN THE GROUND TO SCOOP UP, THEN STEAM-ASSISTED GRAVITY DRAINAGE (SAGD) IS USED.



# SAGD

THIS METHOD INJECTS HOT STEAM INTO THE GROUND UNTIL THE OIL MELTS AWAY FROM THE SAND AND CAN BE PUMPED TO THE SURFACE USING A HORIZONTAL OIL WELL.



STEAM

OIL

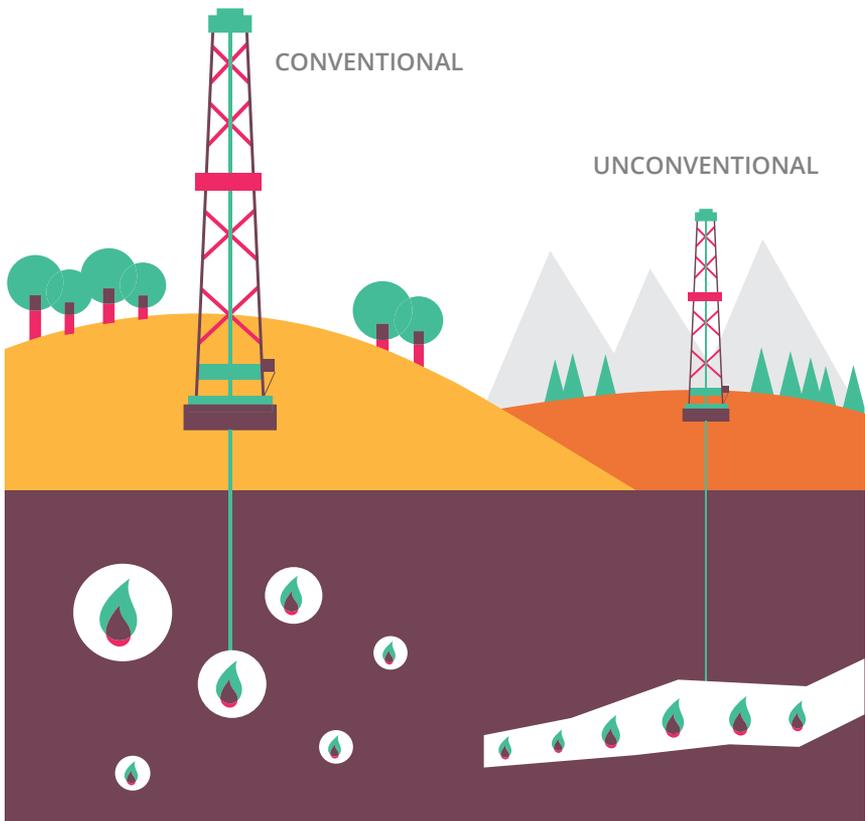
450M

# NATURAL GAS

**ALBERTA PRODUCES ABOUT 67 PER CENT OF CANADA'S NATURAL GAS, AND IS ONE OF THE WORLD'S LARGEST NATURAL GAS SUPPLIERS.**

The province's natural gas reservoirs are actually collections of tiny gas molecules trapped inside cracks and holes in underground rocks all over the province.

Alberta's first natural gas well was drilled in 1883 near Medicine Hat, and the surrounding southeast plains region is still one of the largest conventional gas-producing areas in the country. Opposite that, the province's rugged Rocky Mountain region contains significant quantities of unconventional shale gas — natural gas trapped between layers of fragile shale rock — and is a major focus of modern gas production.



**UNLIKE OIL**, which can be transported by trucks and trains if pipelines aren't available, natural gas cannot be easily shipped by anything other than pipelines. For that reason, Alberta has a massive network of natural gas pipelines, with the very largest pipelines reaching into eastern Canada and the U.S.

## **NATURAL GAS PIPELINES**

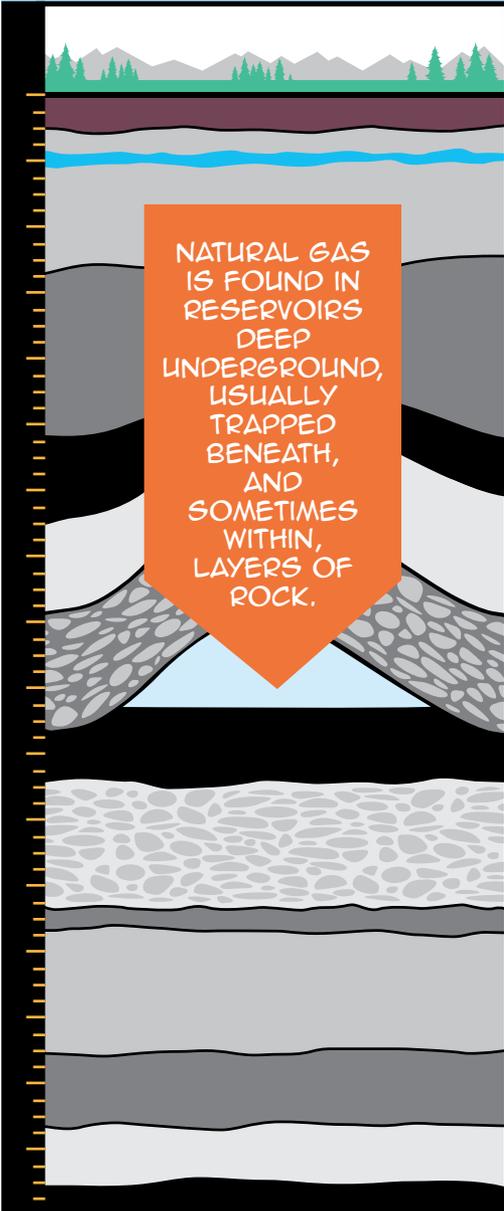


**ABOUT HALF OF ALBERTA'S NATURAL GAS** is used to generate electricity and heat homes and businesses in the province, while the remaining half is shipped by pipelines to the rest of Canada and into the United States.

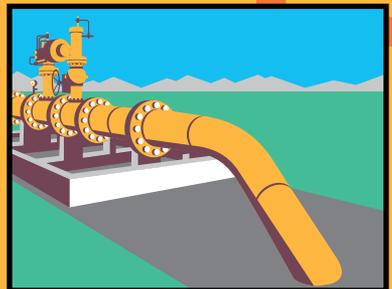
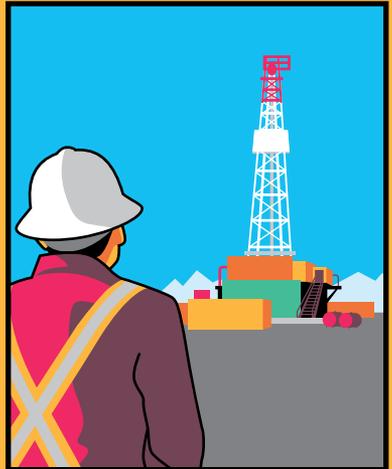


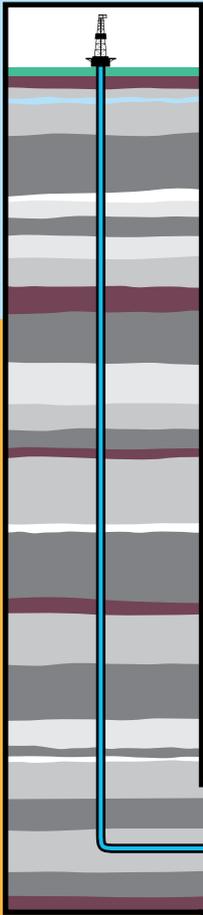
ALBERTA'S ENERGY

# NATURAL GAS

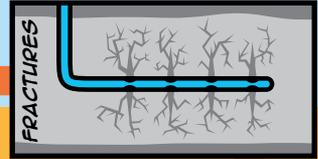
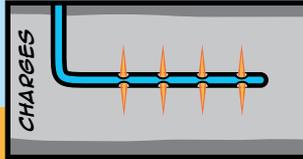


TO EXTRACT **CONVENTIONAL NATURAL GAS** — GAS TRAPPED IN POROUS SANDSTONE AND LIMESTONE FORMATIONS — ENERGY COMPANIES DRILL WELLS INTO THE EARTH, AND THE GAS FLOWS TO THE SURFACE THROUGH THE WELL.

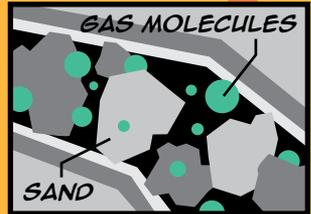




TO EXTRACT *UNCONVENTIONAL NATURAL GAS* — GAS LOCKED WITHIN SHALE ROCK FORMATIONS — ENERGY COMPANIES DRILL HORIZONTAL WELLS DEEP INTO THE EARTH AND SEND A SERIES OF CHARGES DOWN THE WELL TO MAKE SMALL FRACTURES IN THE ROCK IN A PROCESS KNOWN AS “*FRACKING*.”



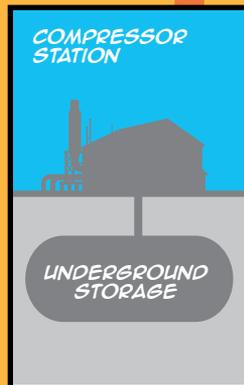
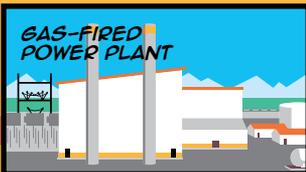
NEXT, A PRESSURIZED MIXTURE OF WATER, CHEMICALS AND SAND, KNOWN AS “FRACKING FLUID,” IS SENT DOWN THE WELL TO HOLD OPEN THE CRACKS IN THE ROCK.



THEN THE GAS, WHICH IS LIGHTER THAN THE FRACKING FLUID, RISES UP THROUGH THE WELL TO THE SURFACE.



EITHER WAY, NATURAL GAS CAN BE USED TO GENERATE ELECTRICITY, AND HEAT HOMES.



# COAL

**BEFORE OIL WAS FOUND IN ALBERTA, COAL WAS KING. FIRST DEVELOPED IN THE LATE 1800s, COAL WAS THE BEGINNING OF ALBERTA'S ENERGY INDUSTRY AND THE BLACK ROCK REMAINS THE MOST PLENTIFUL FOSSIL FUEL IN THE WORLD TODAY.**

Alberta operates 10 coal mines containing 70 per cent of Canada's coal reserves and, along with B.C. and Saskatchewan, accounts for almost all of the country's coal production. Coal provides about 43 per cent of Alberta's electricity and is also exported by rail through British Columbia and then shipped to Japan, China and South Korea.

Although coal was once mined in Edmonton, Lethbridge, Drumheller, Canmore and the area that is now Banff National Park, today most of Alberta's coal mines are in the central and west-central parts of the province. The largest open-pit coal mine in Canada is the Highvale Mine, covering more than 125 square kilometres west of Edmonton near Wabamun.

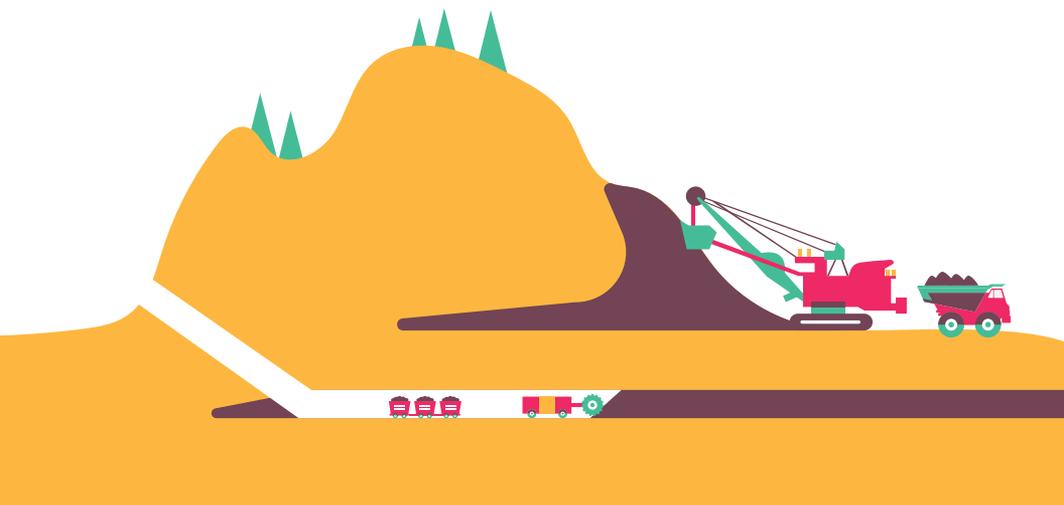
Alberta's coal resources are found on the plains, where strip-mining and open pit-mining are used to remove coal near the surface, as well as in the foothills and Rocky Mountains, where both surface and underground mining methods are used.

**ALBERTA'S  
COAL MINES  
CONTAIN  
70 PERCENT  
OF CANADA'S  
COAL RESERVES**

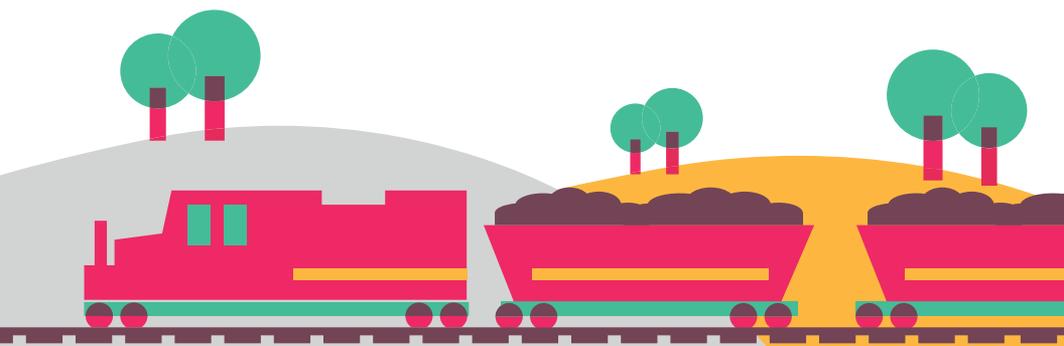


**COVERS  
MORE THAN  
125 SQUARE  
KILOMETRES**

**ALBERTA'S COAL RESOURCES ARE FOUND** on both the plains, where strip mining and open pit mining are used to remove coal near the surface, as well as in the foothills and Rocky Mountains, where both surface and underground mining methods are used.

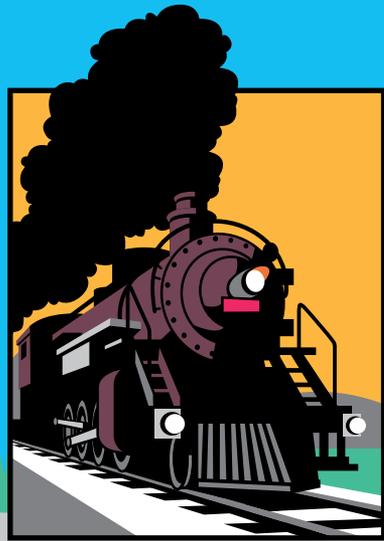


**COAL PROVIDES ALMOST HALF OF ALBERTA'S ELECTRICITY**, and is also transported by rail through British Columbia, then exported to Japan, China and South Korea.

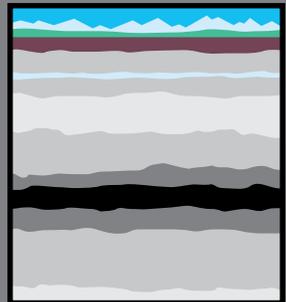


# ALBERTA'S ENERGY COAL

COMMERCIAL MINING  
IN ALBERTA DATES  
BACK TO THE 1880S.



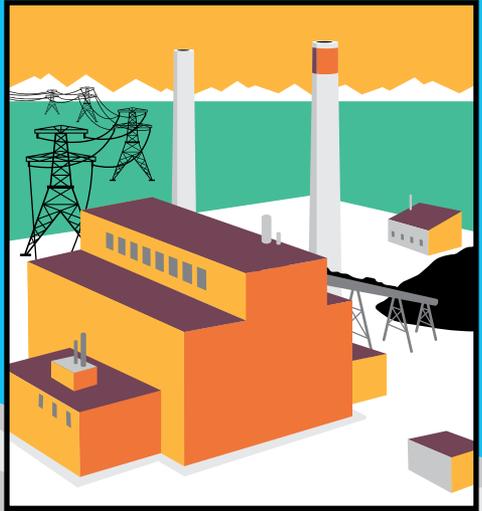
LIKE OIL SANDS  
MINING, COAL CAN  
BE STRIPPED FROM  
THE SURFACE OF  
THE EARTH BY  
MACHINE, CALLED  
STRIP-MINING...



...OR DUG UP BY MINERS WHO BLAST AND BURROW DEEP  
UNDERGROUND INTO BURIED COAL DEPOSITS OR "SEAMS."



ONCE OUT OF THE GROUND, COAL IS TAKEN TO A POWER PLANT WHERE IT IS BURNED TO HEAT WATER TO MAKE STEAM. THE PRESSURE CREATED BY THAT STEAM SPINS A TURBINE, WHICH IN TURN SPINS MAGNETS INSIDE A GENERATOR.



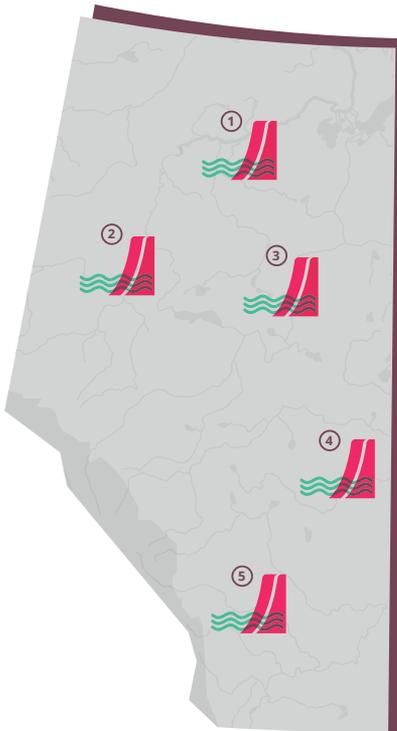
THIS GENERATOR CONVERTS THAT MECHANICAL ENERGY INTO THE ELECTRICAL ENERGY MANY ALBERTANS USE EVERY DAY.



# RENEWABLE ENERGY

**UNLIKE FOSSIL FUELS**, which are found only wherever a fluke of millions of years of geology has left them, renewable energy sources, such as wind, hydroelectricity and biomass (organic material, such as trees, agricultural byproducts and municipal waste, that can be burned or converted into biofuel to produce energy) can be found wherever the wind blows, rivers flow or crops grow. Fortunately for Alberta, the province is blessed with abundant fossil fuel resources and plenty of wind, water and biomass, too.

Alberta has more than 20 hydroelectric dams and generating plants on the province's five main river basins: the Athabasca basin, the North Saskatchewan basin, the Peace basin, the Slave basin and the South Saskatchewan basin. However, only a very small amount of Alberta's electric energy comes from hydro power, with coal still meeting the majority of Albertans' electricity needs.



**1. PEACE/SLAVE RIVER BASIN**

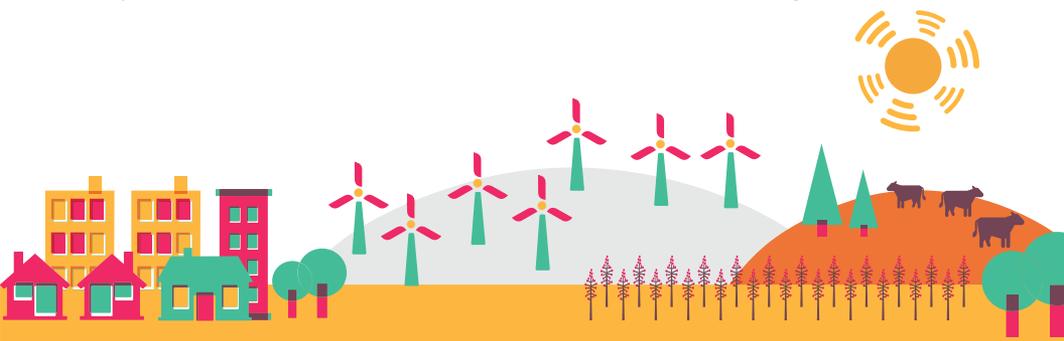
**2. PEACE/SLAVE RIVER BASIN**

**3. ATHABASCA RIVER BASIN**

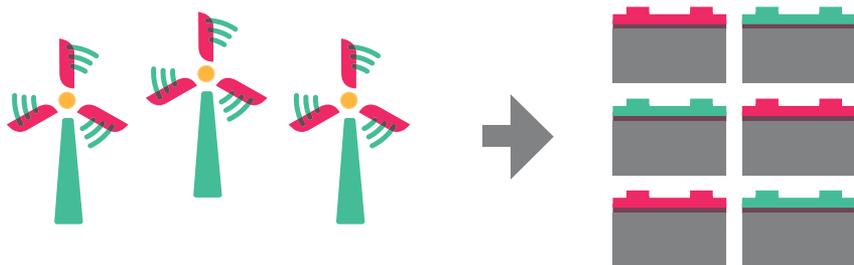
**4. NORTH SASKATCHEWAN RIVER BASIN**

**5. SOUTH SASKATCHEWAN RIVER BASIN**

**ALBERTA IS THE BIRTHPLACE OF WIND ENERGY IN CANADA**, with enough wind turbines scattered along ridges and plains in the southern half of the province to potentially power almost one million homes when the wind is blowing. The province also produces biomass energy, with a total installed capacity of about 417 megawatts. Feedstocks, such as agricultural products, (like corn and canola crops), forestry waste and livestock waste are burned to produce heat or converted into biofuels such as ethanol, biodiesel and biogas.

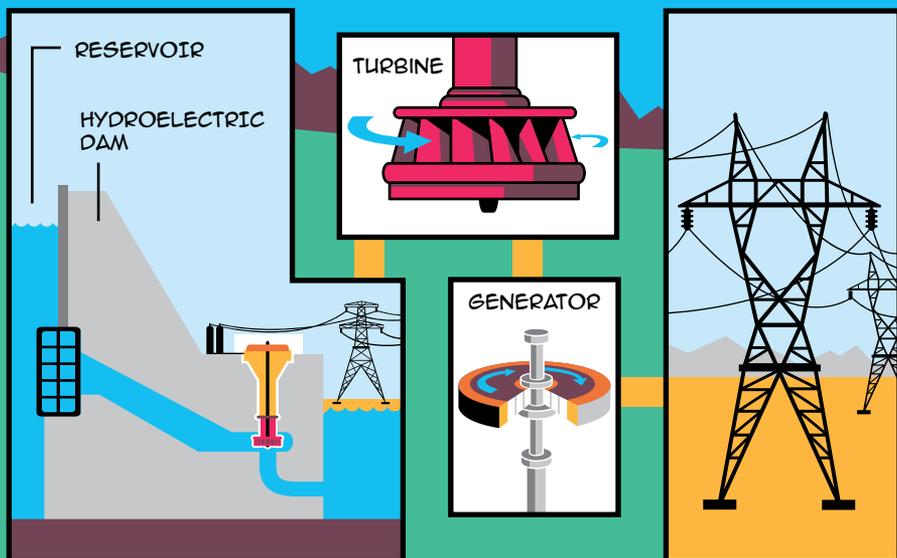


**THE MAIN CHALLENGE FOR WIND ENERGY**, however, is storage. Unlike hydro power, which is stored behind dams in the form of massive water reservoirs, and biomass, which can be converted into liquid or gas fuel, wind cannot be stored and doesn't always blow when electricity is needed. Therefore, wind energy must be converted into chemical energy in the form of batteries, a process that is expensive and loses significant quantities of energy when converted for storage, and then recovered later.

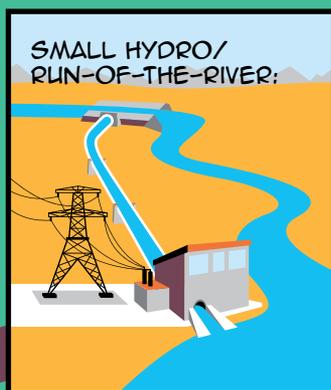
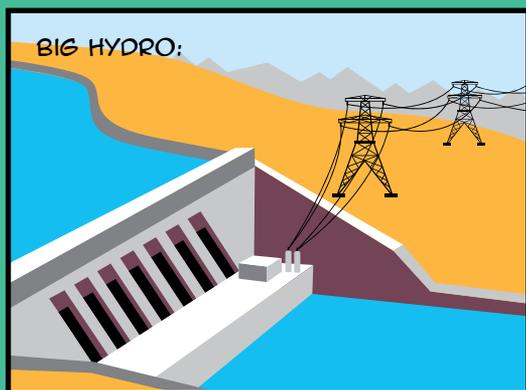


# ALBERTA'S **RENEWABLE ENERGY**

**HYDRO ENERGY** USES THE KINETIC ENERGY — OR MOTION — OF FALLING WATER, WHILE WIND ENERGY HARNESSSES THE SAME KIND OF ENERGY FROM THE NATURAL MOVEMENT OF OUR PLANET'S AIR.



**HYDROELECTRICITY** IS CREATED WHEN WATER FALLING FROM A RIVER DAM SPINS A TURBINE, WHICH SPINS A GENERATOR THAT TRANSFORMS MECHANICAL ENERGY INTO ELECTRICITY.



ROTOR BLADE

GENERATOR

GEAR BOX

NACELLE

A **WIND TURBINE** WORKS THE SAME WAY; HOWEVER, IT'S THE BLOWING BREEZE THAT CATCHES AND TURNS THE LARGE BLADES OF A PROPELLER, WHICH THEN ACTIVATES THE GENERATOR AND CREATES ELECTRICITY.

TRANSMISSION LINES

SUBSTATION

TRANSFORMER



BOTH HYDRO POWER AND WIND ARE **RENEWABLE SOURCES OF ENERGY** BECAUSE, UNLIKE OIL, COAL OR GAS, THEIR FUEL SOURCE — WIND AND WATER — IS NOT CONSUMED IN THE PROCESS AND IS INFINITELY REUSABLE.



To learn about the many ways biomass is converted into energy, visit [energyiq.canadiangeographic.ca/energy\\_mix](http://energyiq.canadiangeographic.ca/energy_mix)

# QUESTION & ANSWER

AS THE PRESIDENT AND FOUNDER OF THE FIRST NATIONS RESOURCE COUNCIL, JOE DION HAS BEEN AT THE FOREFRONT OF FIRST NATIONS ENERGY DEVELOPMENT IN CANADA FOR MORE THAN 30 YEARS. HE IS ALSO THE HEAD OF FROG LAKE ENERGY RESOURCES, WHICH IS WHOLLY OWNED BY THE FROG LAKE CREE COMMUNITY IN EASTERN ALBERTA, ONE OF THE FEW ABORIGINAL OWNED OIL AND GAS PRODUCERS IN CANADA. DION EXPLAINS HOW THESE DEVELOPMENTS HAVE AFFECTED HIS COMMUNITY.

## HOW IMPORTANT IS OIL AND GAS DEVELOPMENT TO THE PEOPLE OF THE FROG LAKE FIRST NATION?

Oil and gas development has been important to the Frog Lake First Nation for the last 30 years and continues to be important. It has generated in excess of \$300 million in royalty revenues to the Nation since development started. It has provided housing, education possibilities, jobs and infrastructure for the community. It has made the Frog Lake First Nation an example of leadership in an industry that is common to other First Nations. In 2000, I was asked by the Frog Lake chief and council to come and run Frog Lake Energy Resources Corporation. The company was more than half a million dollars in debt when I took it over and we grew from just 24 barrels of oil a day to almost 4,000 barrels a day in 2013.

**GREW OIL FROM  
24 BARRELS PER DAY  
TO 4,000 PER DAY**



## HAS THE RESOURCE CHANGED THINGS ECONOMICALLY FOR THE NATION?

It most certainly has — for the better. For starters, numerous jobs were created for some of the young people eager to work here. These skills are now transferable to any oil-related jobs off the reservation where, in some cases, FLERC has invested. Several businesses owned by the Nation and its members were started, such as Frog Lake Oilfield Services, and these are also competing for contract opportunities in oil development taking place off the reserve.

**GENERATED  
IN EXCESS OF  
\$300 MILLION  
IN ROYALTY REVENUES  
TO THE NATION**



**JOE DION, PRESIDENT AND FOUNDER OF THE FIRST NATIONS RESOURCE COUNCIL**

### **WHAT DOES THE FUTURE OF OIL AND GAS DEVELOPMENT AT FROG LAKE LOOK LIKE?**

It means their wholly owned oil company, FLERC, will continue to actively pursue the development of approximately four billion barrels of oil still in the ground with new technology, such as steam-assisted gravity drainage and other enhanced oil recovery methods, with their existing partners. FLERC has four strong partners active on the reservation and they continue to have lots of interest on the lands. FLERC just recently invested in the cogeneration facility in the nearby Pengrowth Lindbergh thermal oil project adjacent to the Frog Lake reserve.

### **I HAVE BEEN ACTIVELY ENCOURAGING AND SHOWING OTHER FIRST NATIONS WHAT THEY CAN DO WITH THEIR RESOURCES**

### **YOU HAVE ENCOURAGED OTHER FIRST NATIONS TO GET INVOLVED IN DEVELOPING THEIR ENERGY RESOURCES. WHY?**

For the past 30 years, as president of the First Nations Resource Council, I have been actively encouraging and showing other First Nations what they can do with their resources. I was consulting in the resource sector at the time but no one was really taking my advice. So I took up the offer from the Frog Lake First Nation to lead their oil company in 2000, and I showed how it could be done. I do it because the First Nations can gain so much more by engaging in the development of their resources through experience, and the monetary gain is enormous as well. They get the royalties and the revenues generated by the oil company. FLERC has issued large dividends to the Nation and they have helped the community immensely.

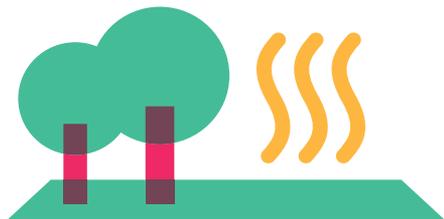
# ENVIRONMENTAL IMPACTS

**ALL ENERGY SOURCES IMPACT THE ENVIRONMENT. FOSSIL FUELS — NAMELY COAL, OIL AND NATURAL GAS — EMIT GREENHOUSE GASES (GHGs) WHEN BURNED (THE KIND OF GASES THEY EMIT AND IN WHAT QUANTITY DIFFERS FOR EACH).**

Although renewable energy sources such as wind and hydroelectricity emit little to no GHGs when operating, their infrastructure requires the use of other GHG-emitting fossil fuels for their construction and maintenance.

Locating and developing energy resources also has an impact on the environment. Exploring for resources such as coal, oil and natural gas, then getting them out of the ground and refining them into usable fuel requires energy and therefore also emits GHGs into the atmosphere. For oil sands, about 25 per cent of their related GHG emissions happens in this exploration and refining phase, while the remaining 75 per cent of the emissions are produced when the fuel is used.

This chart compares Alberta's major energy sources and their impacts on the environment. It looks at four main criteria: average weight in kilograms of carbon dioxide (CO<sub>2</sub>, the most commonly measured GHG) per million British Thermal Units (BTUs, a measure of energy) emitted when using the energy source for fuel, the infrastructure needed to produce the energy resource, the impact on the landscape of developing these resources, and how long it takes the land to return to its previous, or similar, productivity.



To learn more about how energy sources contribute to climate change, visit [energyiq.canadiangeographic.ca/learning\\_centre](https://energyiq.canadiangeographic.ca/learning_centre)

**ALBERTA'S MAJOR ENERGY SOURCES AND THEIR IMPACTS ON THE ENVIRONMENT**



**COAL**



**CRUDE OIL**



**NATURAL GAS**



**RENEWABLES**

**TYPE FOUND IN ALBERTA**

Bituminous & sub-bituminous coal

Mostly oil sands, a mixture of sand, clay, water and oil; some conventional crude oil

Mostly conventional; some unconventional

Hydroelectric wind and biomass

**AVERAGE KGS OF CO<sub>2</sub>/MILLION BTU**

**95.25**

**75.57**

**53.00**

**Little to no GHGs**

**INFRASTRUCTURE NEEDED**

Excavators, trucks, processors, coal-fired power plants, transmission lines

Excavators, trucks, drilling rigs, upgraders, refineries and pipelines

Drilling rigs, processors, gas-burning power plants, transmission lines

Wind turbines, biomass feedstocks and generating plants, hydroelectric dams, transformers, transmission lines

**IMPACT ON LANDSCAPE**

Vast areas of land are disturbed and removed entirely

For mining, vast areas of land are stripped and tailings ponds remain for several years. For conventional drilling, very little land is used

Minimal clearing of trees around a well site, if necessary. However, fracking can potentially damage the water table and the structure of the soil and rock below the surface

Wind farms do not impact landscape, but can harm local avian populations. Hydroelectric dams can harm aquaculture. Biomass can include crops, such as canola or corn, and generating facilities can produce some GHGs

**TIME FOR LAND TO RETURN TO PREVIOUS PRODUCTIVITY**

Many years, though often the landscape is forever changed

For oil sands, many years of reclamation are necessary. In the case of conventional oil, there is often no disruption to previous productivity

No disruption to previous productivity on the surface. Impacts of fracking are still being measured

Immediately, though hydroelectric dams can cause long-term changes to river ecosystems

# ALBERTA'S ENERGY ECONOMY

## FROM THE OFFICE TOWERS OF CALGARY TO THE OIL SANDS OF FORT MCMURRAY, ALBERTA'S ECONOMY DEPENDS LARGELY ON THE PROVINCE'S ENERGY RESOURCES.

Energy accounts for about one-quarter of all the goods produced and services provided within Alberta, and half of the province's total exports. This resource wealth has led to Alberta having the highest population growth of any province or U.S. state over the past decade. About one in six Albertans work in the energy sector, whether directly as natural gas or oil rig operators, or indirectly as investment advisers or environmental monitors.

Because the global demand for Alberta's energy rises and falls both seasonally and in accordance with output from other oil and gas producing regions, the energy industry is subject to periods of boom and bust. These cycles affect the availability of employment for tens of thousands of Albertans, as well as those who come to Alberta for work.

The lack of pipelines running west through British Columbia, south through the United States and to Eastern Canada have significantly affected the price of Canadian oil on the world market and have restricted the quantities of oil that Alberta's producers can sell. Instead, oil companies ship much of their product by train.

The wealth generated from Alberta's energy resources is shared with other provinces in the form of transfer payments. These payments help provide residents of less well-off provinces with an equal quality of life and government services.



# ENERGY FUTURES

THE ENERGY LANDSCAPE IN CANADA, AND AROUND THE WORLD, IS RAPIDLY CHANGING AS INDUSTRIES ARE TASKED WITH DEVELOPING CLEANER AND LESS EXPENSIVE WAYS TO MEET A GROWING ENERGY DEMAND. HERE'S WHAT THE LEADERS OF CANADA'S ENERGY INDUSTRIES HAVE TO SAY ABOUT THEIR FUTURE.

"Canada has the third-largest crude oil reserves in the world, and we are the world's fifth largest natural gas producer. The future of our industry, and much of our country's economic success, depends on our ability to responsibly produce and sell our oil and natural gas to global markets. Transporting more of our products to more markets — by pipeline, rail and ship — would help Canada's oil and natural gas industry to remain successful and provide jobs to Canadians."

– **GREG STRINGHAM**, VICE PRESIDENT OF MARKETS AND OIL SANDS WITH THE CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS

"As an industry, we face the question of how we constantly demonstrate that we're worthy of the trust of the Canadian public. Enhancing our reputation and credibility with Canadians depends on our ability to continuously improve and engage with stakeholders pro-actively and transparently."

– **BRENDA KENNY**, PRESIDENT AND CEO OF THE CANADIAN ENERGY PIPELINE ASSOCIATION, FROM A NEWS RELEASE (JUNE 9, 2014)

"In many parts of Canada, we are blessed with an abundance of clean, renewable electricity. A key component of any meaningful strategy to reduce GHG emissions must be to clean our electricity grids through significantly enhanced use of wind and other renewable energy sources in provinces like Alberta and Saskatchewan that are highly dependent on coal and natural gas for electricity generation."

– **ROBERT HORNING**, PRESIDENT OF THE CANADIAN

WIND ENERGY ASSOCIATION, FROM CANWEA.CA (SEPTEMBER 9, 2015)

"While global coal markets are currently depressed, due to an oversupply of coal and low prices, the future of the Canadian industry remains very strong. Coal is a critical commodity needed around the world for power generation and steel production. Coal is a cyclical industry and has been through tough economic times before and rebounded. It's a matter of when, not if, markets will recover. Industry analysts project that the global demand for thermal coal (used in electricity generation) will double in the next 20 years, and demand for metallurgical coal (used in steel-making) could increase by nearly 50 per cent."

– **ANN MARIE HANN**, PRESIDENT OF THE COAL ASSOCIATION OF CANADA

"What most people don't know is that today, natural gas already has a central place in Canada's energy mix, meeting more than 30 per cent of the country's energy needs... Looking to the future, we think there is significant opportunity for natural gas to affordably and efficiently meet even more of Canada's residential, institutional and industrial energy needs. These efficiency gains and energy cost savings drive productivity and attract investment to Canada."

– **TIMOTHY EGAN**, PRESIDENT AND CEO OF THE CANADIAN GAS ASSOCIATION, FROM A STATEMENT TO THE CANADIAN PARLIAMENTARY COMMITTEE ON NATURAL RESOURCES (FEBRUARY 26, 2013)

# ENERGY QUIZ

## TEST YOUR KNOWLEDGE OF ALBERTA'S ENERGY RESOURCES.

### 1) CHOOSE THE ANSWER THAT BEST DESCRIBES THESE ENERGY SOURCES IN ORDER FROM HIGHEST CARBON EMISSIONS TO LOWEST:

- A) Oil, natural gas, coal, renewables    B) Natural gas, renewables, coal, oil  
C) Coal, oil, renewables, natural gas    D) Coal, oil, natural gas, renewables

### 2) TRUE OR FALSE:

Most of the electricity used in Alberta comes from burning coal.

### 3) TRUE OR FALSE:

Most of the greenhouse gas emissions from gasoline happen when it is produced and refined rather than when it is burned.

### 4) CHOOSE THE ANSWER THAT BEST DESCRIBES ALBERTA'S OIL SANDS REGIONS IN ORDER FROM LARGEST TO SMALLEST:

- A) Athabasca, Peace River, Cold Lake    B) Peace River, Athabasca, Cold Lake  
C) Athabasca, Cold Lake, Peace River    D) Cold Lake, Athabasca, Peace River

### 5) TRUE OR FALSE:

Unlike natural gas, the energy generated from wind is easy to store.

### 6) TRUE OR FALSE:

Calgary's light-rail public transit system is entirely powered by wind energy.

### 7) TRUE OR FALSE:

Wind and hydroelectricity produce little to no greenhouse gas.

### 8) TRUE OR FALSE:

The Athabasca oil sands is the only oil sands in Alberta that is shallow enough to be collected using excavators and trucks.

### 9) WHAT ARE THE NAMES OF ALBERTA'S FIVE MAIN HYDROELECTRICITY PRODUCING RIVER BASINS?

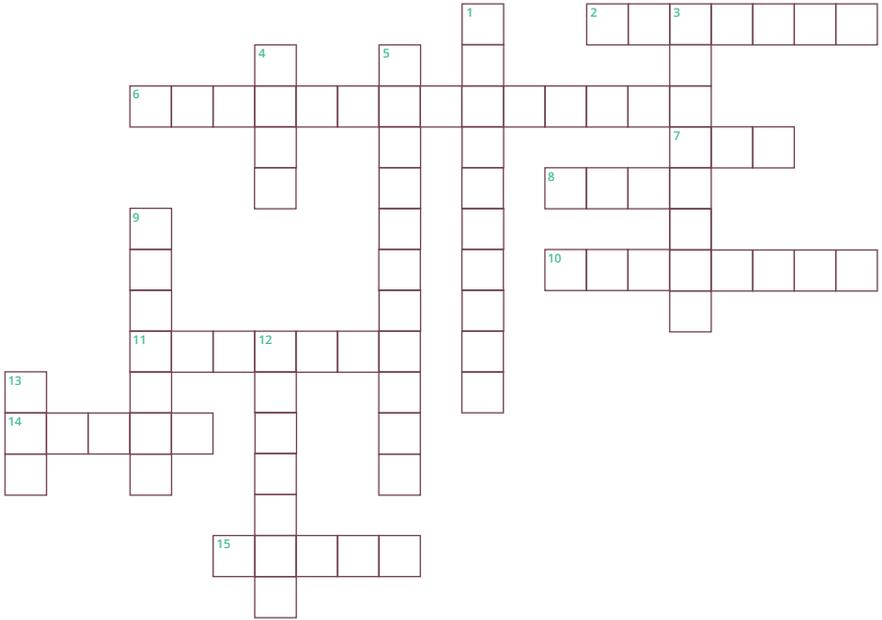
### 10) TRUE OR FALSE:

Biomass energy can be produced from agricultural crops, forestry waste and livestock waste.



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# CROSSWORD PUZZLE



## ACROSS

- 2)** Type of energy derived from crops
- 6)** Industry term used for fracking method to extract natural gas
- 7)** One in \_\_\_\_\_ Albertans work in the energy sector
- 8)** Alberta coal is exported by rail to B.C., then shipped to countries in \_\_\_\_\_

- 10)** Oil sand deposits include Peace River, Athabasca and \_\_\_\_\_ (2 wds)
- 11)** At a wind farm, a wind \_\_\_\_\_
- 14)** Energy produced from moving water
- 15)** One of the five river basins with a hydro electric dam

## DOWN

- 1)** Alberta produces 67 per cent of this resource in Canada
- 3)** A mix of sand, clay, water and bitumen (2 wds)
- 4)** Resource that is mined and used to generate electricity
- 5)** First natural gas well was in 1883 near \_\_\_\_\_ (2 wds)

- 9)** Wind power stored as chemical energy
- 12)** An example of this is ethanol
- 13)** Acronym for greenhouse gases

# ANSWER KEY

## ANSWERS TO ENERGY QUIZ (PG 26):

- 1) d) Coal, oil, natural gas, renewables
- 2) True
- 3) False
- 4) c) Athabasca, Cold Lake, Peace River
- 5) False
- 6) True
- 7) True
- 8) True
- 9) Athabasca basin, North Saskatchewan basin, Peace basin, Slave basin and South Saskatchewan basin
- 10) True

## ANSWERS TO CROSSWORD (PG 27):

### ACROSS

- 2) Biomass
- 6) Unconventional
- 7) Six
- 8) Asia
- 10) Cold Lake
- 11) Turbine
- 14) Hydro
- 15) Peace

### DOWN

- 1) Natural gas
- 3) Oil sands
- 4) Coal
- 5) Medicine Hat
- 9) Battery
- 12) Biofuel
- 13) GHG

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